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A Study of Nutritional Status in Patients of Nephropathy with Type-2 Diabetes Mellitus Undergoing Hemodialysis.

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Abstract

Background: Diabetic nephropathy has become the leading cause of chronic kidney failure and there is a progressive increase in the incidence of End stage renal failure in patients with type-2 Diabetes Mellitus. Their survival is influenced by their nutritional status as they are at increased risk of malnutrition.

Aims & Objective: The present study was carried out to access the importance of nutritional status in the study subjects and to use the information for lowering the mortality and morbidity associated with the disease process.

Materials & Methods: The study population was divided into normal control group consisting of 40 healthy individuals and a test group consisting of 80 patients who were diagnosed to be having End stage renal disease (Nephropathy Stage-5). The test group was further divided equally into 2 sub-categories Group I, Group II based on those who were undergoing hemodialysis and those who were not undergoing hemodialysis respectively. Nutritional status was assessed by serum albumin, serum protein, serum iron, serum hemoglobin, Body mass Index (BMI) and lean body weight (LBW).

Results: There is a significant decrease in levels of serum albumin and serum protein in group-I and group-II ($P<0.01$) compared to control. Hemoglobin also shows a significant decrease in both the test groups compared to controls but the study did not show any significant difference in level of serum iron in test group-I and II. Difference in LBW in group-I had no significance compared to controls but significance is seen with test group-II ($P=.032$) when compared to control.

Conclusion: Protein energy malnutrition and anemia are common findings in hemodialysis patients having history of nephropathy with type-2 diabetes mellitus. With knowledge of the various risk factors which can increase the morbidity and mortality in the Diabetic patients undergoing hemodialysis, we can employ preventive strategies for better management of the patients and thereby improving their survival.

Introduction

Diabetic nephropathy is a clinical syndrome characterized by persistent albuminuria (>300 mg/24 hr), a relentless decline in GFR, raised arterial BP, and enhanced cardiovascular morbidity and mortality 1, 2. End-stage renal failure is one of the most serious complications of

diabetes mellitus, and diabetes is the most common cause of end-stage renal failure which can ultimately require renal replacement therapy with dialysis or transplantation. Patients are often severely catabolic and are predisposed to develop malnutrition, particularly during periods of intercurrent illness and fasting, but also from ill-advised recommendation of protein-restricted diets, particularly when these anorectic patients concomitantly reduce energy intake. Serum Protein, Body mass index (BMI), serum albumin, prealbumin, cholesterol, pre-dialysis creatinine, normalized protein catabolic rate and lean body mass (LBM) are the parameters often used for assessing nutritional status in the diabetic patients undergoing hemodialysis.

Malnutrition is a potent independent predictor of mortality, and its presence justifies an early start of renal replacement treatment 3. In diabetic patients with renal failure compared with non diabetic patients, anemia is more frequent and more severe at any given level of GFR4. The major contributor of anemia includes relative erythropoietin deficiency due to failure of erythropoietin production resulting in insufficient production of erythrocytes 5. Iron deficiency may be associated with malnutrition and can lead to the development of anaemia. So as seen, protein energy malnutrition and anemia are common findings in hemodialysis patients having history of nephropathy with type-2 diabetes mellitus. Identification and proper management of these patients can result in significant reduction in morbidity and mortality which is the purpose of undertaking the present study.

Materials and Method

The present study was conducted in the Department of General Medicine of GEMS Hospital. Oral informed consent was obtained from the patients and normal subjects prior to study. Control group consisting of 40 individuals were selected randomly among persons from different sectors of the society belonging to diverse socio economic status and were not having pathology referable to any system either in the past or present. Test group were selected from the department of Nephrology were amongst those who were admitted for End stage renal disease (ESRD) ie stage-5 with history of type-2 diabetes mellitus (diagnosis done on the basis of clinical history, clinical examination and relevant laboratory parameters). Test group-1 contained patients of nephropathy with type-2 Diabetes mellitus undergoing hemodialysis and Test group-2 contained patients of nephropathy with type-2 diabetes mellitus not undergoing hemodialysis each group consisting of 40 patients. Patients with urinary tract infection/pyelonephritis, Nephrolithiasis (kidney or bladder stones),trauma, instrumentation, catheterization, or foreign bodies in the urinary tract, sickle cell anemia, cancer (prostate, bladder, kidney), benign prostatic hypertrophy, polycystic kidney disease, familial haemochromatosis, liver disease, prolonged use of analgesics, any recent infection due to infectious etiology and any type of surgery were excluded from the current study.

Taking all aseptic and antiseptic precautions, 3ml of blood is drawn from the Ante cubital vein of the patient. Serum albumin was measured by BCG method6, serum protein by biurett method7, serum creatinine by Alkaline Picrate method8, serum iron by Ferrozine method9 using UV spectrophotometer using standard kits for the respective parameters. Height was measured by using a measuring tape and weight by standard weighing machine . BMI(Body Mass Index), LBW(Lean Body weight) and GFR (Glomerular filtration rate) were calculated by using the following formula:-

BMI=Weight (kg)/ Height (sq mtr), LBW(men)= (1.10 x Weight(kg)) - 128 x (Weight2/(100 x Height(m))2) ,

LBW (women) = (1.07 x Weight(kg)) - 148 x (Weight2/(100 x Height(m))2)

GFR by Cockcroft-Gault formula[10].

Observations & Results

The test group comprises of 80 patients; grouped into 2 sub-categories of 40 patients each Group I (patients undergoing hemodialysis) and Group II (patients not undergoing hemodialysis) . Our results from table I list the mean values of various biochemical parameters in Control and End stage renal disease patients (ESRD)- Goup I and II. There is a significant decrease in levels of serum albumin, serum protein , blood hemoglobin and serum creatinine in group-I and group-II compared to control but the study did not show any significant difference in level of serum iron in test group-I and II and Lean body weight in group-I compared to controls as seen from Table 2.

Table-1 Biochemical parameters of Control and End stage renal disease patients (ESRD)

Parameters	**Mean ± SD**		
	Control		**ESRD Group – I ESRD Group- II**
Serum Albumin (gm/dl)	4.185±0.46	2.4975±0.49	2.4375±0.35
Serum Protein (gm/dl)	7.20±0.52	5.82±0.62	5.78±0.58
Serum Iron (μg/dl)	118.7±36.00	118.075±53.03	110.9±44.02
Serum creatinine (mg/dl)	0.805±0.21	7.95±3.48	6.91±3.05
BMI (kg/m^2)	20.947±1.57	19.592±1.88	19.322±1.98
Hemoglobin (gm/dl)	15.062±1.28	13.225±1.668	11.55±1.72

Lean Body Mass (Kg)	48.5±6.1	46.14±5.3	45.75±5.1
G.F.R (ml/min)	91.88±31.01	9.68±5.5	11.84±6.81

Table: 2 Comparison of means between groups

Parameters	**#Control v/s Test Group I**			**#Control v/s Test Group II**			**#Control v/s Test Group II**		
Serum Albumin (gm/dl)	**Df**	**'t'**	**P value**	**Df**	**'t'**	**P value**	**Df**	**'t'**	**P value**
Serum Albumin	78	15.67	<0.01**	78	18.79	<0.01**	78	0.6201	0.5370_{NS}
Total Protein	78	10.716	<0.01**	78	11.496	<0.01**	78	0.34	0.7396^{NS}
Serum Creatinine	78	12.927	<0.01**	78	12.617	<0.01**	78	1.404	0.1643^{NS}
Serum Iron	78	0.0616	0.9510NS	78	0.8675	0.3883NS	78	0.658	0.512^{NS}
BMI	78	3.490	<0.01**	78	4.064	<0.01**	78	0.624	0.5345^{NS}
Haemoglobin	78	5.525	<0.01**	78	10.326	<0.01**	78	4.412	$<0.01^{**}$
LBW	78	1.84	0.0695NS	78	2.172	0.0329*	78	0.310	0.7569^{NS}
G.F.R	78	16.49	<0.01**	78	15.94	<0.01**	78	1.54	0.126^{NS}

 # (*p<0.05-Significant, ***p<0.01-Highly Significant, NS-Not significant)

Discussion

The present study showed that the patients in the test group , Group I and Group II had significantly lower values of serum albumin as compared to the control subjects (P<0.01). Test Group II have a lower mean serum albumin value compared to Group I which signifies improvement in the serum albumin level with subsequent hemodialysis. The lower albumin level signifies the poor

nutritional status in the test group when compared to healthy Non-Diabetic Controls which is comparable with the study by Noe" L J.M. Cano et al 2001 11. Serum protein were also found to be significantly lower (P<0.01) in the test groups as compared to the control subjects. Lower levels of serum protein in test group compared to the healthy control can be attributed to the fact that anorexia and prolonged habituation to dietary restriction, the dietary intake of energy (30–35 kcal/kg/d) and protein (1.3 g/kg/d) intake often falls short of the recommended target in diabetic patients on hemodialysis[12].

Mean hemoglobin level is found to be significantly lowered (P<0.01) in both the test groups as compared to the control groups. But the level of hemoglobin were found better in group-1 patients as compared to group-2 patients. It may be due to the level of hemoglobin tending to improve with successive hemodialysis. Moreover diabetic patients undergoing hemodialysis were given iron supplements.

In diabetic patients with renal failure compared with non diabetic patients, anemia is more frequent and more severe at any given level of GFR. The major cause of anemia is an inadequate production of the plasma erythropoietin (EPO). Serum Iron levels did not have any significance when compared with the healthy controls indicating that cause of anemia in the test subjects could be due to factor other than iron deficiency anemia. The mean serum Iron level in Test group-2 was lower than Group-1 which can be attributed to the fact that patients undergoing hemodialysis were taking iron supplements.

Our study shows BMI was significantly lowered in both patients of nephropathy with type-2 diabetes with or without hemodialysis ie Group I and II as compared to control which is contradictory to other studies which showed decrease in BMI in Diabetics undergoing hemodialysis[13]. The lower BMI in the test group may be attributed to the fact that Diabetics are more prone to protein energy malnutrition due to excessive protein catabolism and have diet restriction plan.

The test groups had a lower mean LBW compared to control and the difference was significant (p=0.032) when the healthy controls were compared with the Diabetic nephropathy patients not undergoing hemodialysis suggesting increase loss of muscle mass in Diabetic patients with End Stage Renal Disease which tends to improve with hemodialysis.

Conclusion

In hemodialysis patients having history of nephropathy with type-2 diabetes mellitus protein energy malnutrition and anemia are common findings. As an outcome within the scope and limitation of the present study that is the number of available patients within the time frame, and the fact that the study was conducted only in one center, it may be proposed that the knowledge of the various risk factors associated with the morbidity and mortality in the Diabetic patients undergoing hemodialysis can help us to employ preventive strategies for better management of the patients and thereby improving their survival.

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